

Quality Assurance Guidelines
For Information Resources Projects in
Texas State Agencies

**Process for Evaluating the
Effectiveness and Efficiency
Of Information Resources Projects**

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Table of Contents

1. PURPOSE OF THE PROCESS	3
2. SCOPE OF THE PROCESS.....	3
2.1 ACTIVITIES TAILORING.....	4
2.2 ROLES TAILORING.....	4
2.3 DELIVERABLES TAILORING.....	5
3. ROLES IN THE PROCESS	5
4. GRAPHICAL OVERVIEW OF THE PROCESS	6
5. ACTIVITY DESCRIPTIONS	7
5.1 TAILOR MEASURES.....	7
5.2 APPLY MEASURES.....	8
6. MEASURES OF THE MEASUREMENT PROGRAM.....	9
7. VERIFICATION ACTIVITIES	9
8. DOCUMENT CONTROL.....	10
A. ADDITIONAL RESOURCES	10
B. SUPPORTING TEMPLATES	11
C. SUPPORTING CHECKLISTS	11

1. PURPOSE OF THE PROCESS

This process is designed to help an agency determine the measures it needs to evaluate information resources (IR) project effectiveness and efficiency, and show how to set up an appropriate measurement process. The measures are intended to provide insight into the effectiveness and efficiency of IR projects, facilitating evaluation of project status and providing the basis for proactive project control.

This process can be applied to any kind of IR project (indeed, to any kind of project.)

2. SCOPE OF THE PROCESS

This process covers the development, implementation, and operation of project measures that apply to project progress, product quality, and process effectiveness for a project.

“As a process, performance measurement is not simply concerned with collecting data associated with a predefined performance goal or standard. Performance measurement is better thought of as an overall management system involving prevention and detection aimed at achieving conformance of the work product or service to customer's requirements. Additionally, it is concerned with process optimization through increased efficiency and effectiveness of the process or product. These actions occur in a continuous cycle, allowing options for expansion and improvement of the work process or product as better techniques are discovered and implemented.”¹

The effectiveness and efficiency measures of an IR project “should reflect the purpose, objective, and goals of the system. The criteria by which a project is measured should address the business or service delivery requirements of the system to effectively assess its success².” The problems, risks and lack of information associated with the project's purpose, objectives and goals drive the identification of the measures needed by the project. The Issues-Categories-Measures Table included in the appendices to this guideline shows common areas of issues, related categories of measures, and examples of specific measures that are useful to address issues in those areas.

The activities in the measurement process may be done slightly differently for different types of projects. The following tailoring tables provide suggestions for adaptation. For further guidance

¹ “How to Measure Performance: A Handbook of Techniques and Tools”, prepared by the Training Resources and Data Exchange (TRADE) Performance-Based Management Special Interest Group for the Special Project Group, Assistant Secretary for Defense Programs and the Office of Operating Experience, Analysis and Feedback, Assistant Secretary for Environment, Safety and Health U.S. Department of Energy, October 1995

² “Quality Assurance Review Guide for Major Information Resources Projects”, Version 1.0, Department of Information Resources, Office of the State Auditor, November 1996

on tailoring a process based on project characteristics, see *Tailoring the Guidelines* elsewhere in this manual.

2.1 ACTIVITIES TAILORING

The activities in this process may be done slightly differently for different types of projects. The following tailoring tables provide suggestions for adaptation.

Activity	Low QA Focus	Medium QA Focus	High QA Focus
Tailor measures	Usually confined to a small number of critical issues, such as schedule and budget performance	Combines risk analysis results with high level issue categories	Complete integration of risk analysis, financial performance requirements, and issue identification
Apply measures	Generally used for monitoring project performance	Useful for estimation and monitoring project performance	Generally involves generating estimates, examining feasibility, and monitoring project performance

2.2 ROLES TAILORING

These roles may be handled differently for different types of projects.

Role	Low QA Focus	Medium QA Focus	High QA Focus
Measurement Analyst	Done by Project Manager	Part time role for Project Team member	Full time role; may be part of Project Team or independent of Team
Project Management	Serves as Measurement Analyst	Delegates measurement analysis but retains measurement planning responsibility; makes project decisions based on analysis information	Delegates measurement planning and analysis, but reviews plans and analysis; makes project decisions based on analysis information, or defers to senior management when necessary

2.3 DELIVERABLES TAILORING

These deliverables may be done slightly differently for different types of projects.

Activity Deliverable	Low QA Focus	Medium QA Focus	High QA Focus
Measurement Plan (section of the Project Development Plan)	May use only standard organization measures, with no measurement plan	Section of Project Development Plan, with appendices for measurement specifications	Section of Project Development Plan, with appendices for measurement specifications.
Reported analysis results	Informal notes and email communication	Documentation in project notebook; email and written communication when needed; subject to sampled review by QA	Documentation in project notebook; probable; formal analysis supported by tools; email and written communication; reviewed by QA

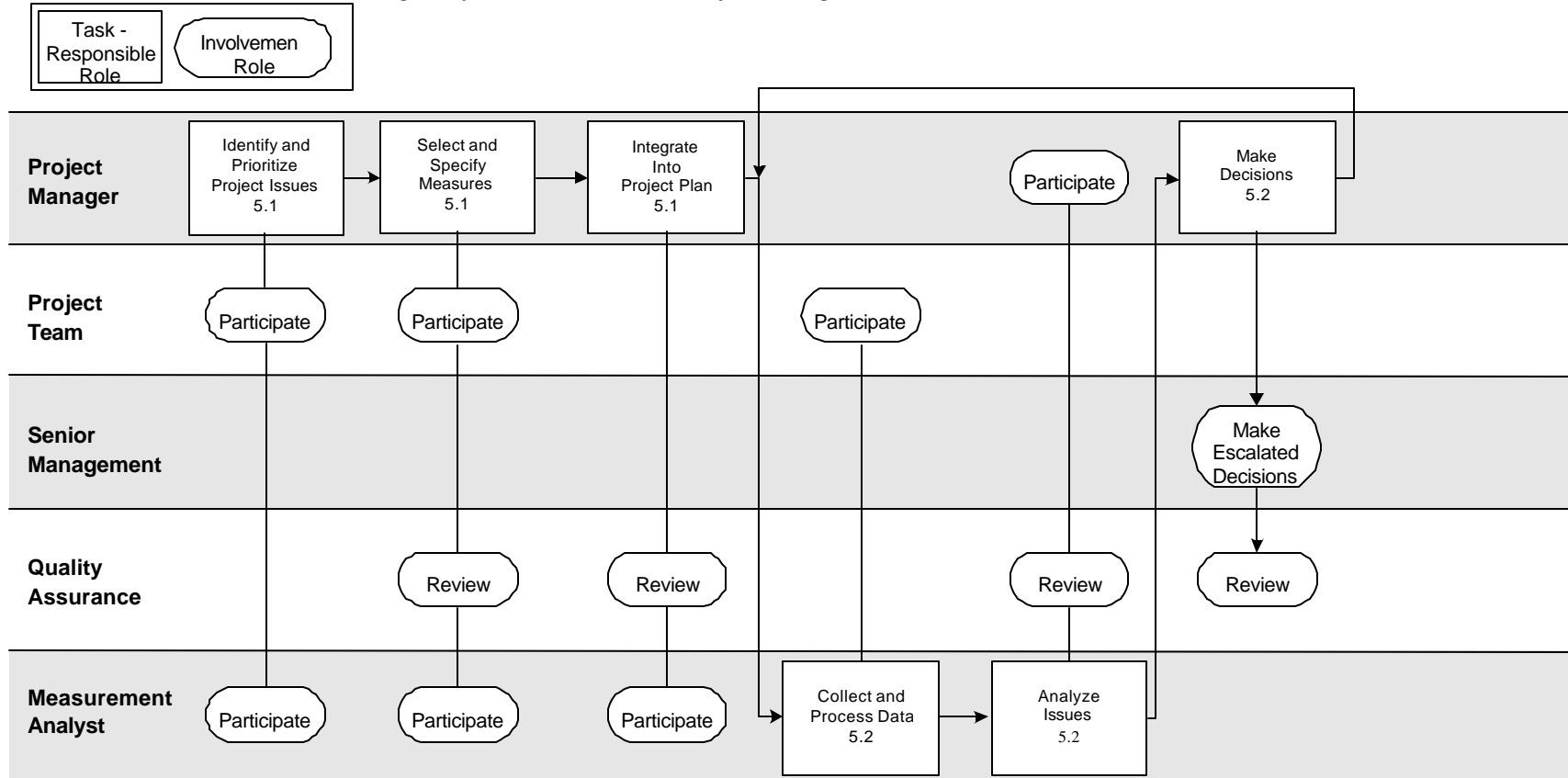
3. ROLES IN THE PROCESS

Those involved in project measurement include all affected by the issues to the project, who participate in identifying those issues and using the measurement results to handle them. In general, project team members provide the measurement data, which is processed by a measurement analyst, to generate results for those handling the issues and making decisions.

Role Names	Role Definitions
Senior Management	<ul style="list-style-type: none">• Uses measurement results to make organization-level decisions
Project Management	<ul style="list-style-type: none">• Identifies and manages project effectiveness and efficiency issues• Uses measurement results to make project decisions
Measurement Analyst	<ul style="list-style-type: none">• Tailors measures to address project effectiveness and efficiency issues• Collects and analyzes measurement data and reports results
Project Team	<ul style="list-style-type: none">• Uses measurement results in software engineering efforts• Provides measurement data
Quality Assurance	<ul style="list-style-type: none">• Reviews measurement plan data• Reviews analysis results• Reviews decisions based on analysis results

4. GRAPHICAL OVERVIEW OF THE PROCESS

Note: The numbers in each rectangle refer to activities in the following section.



5. ACTIVITY DESCRIPTIONS

The following sections provide details on each activity: a description of the purpose, entry and exit criteria, and the sequence of tasks to be done. Tasks are shown along with the roles generally responsible and/or involved in those tasks. There are several approaches that can be taken when developing useful measures. The Goal-Question-Measure paradigm is commonly used for software systems. Practical Software Measurement (PSM) is another commonly used approach, which is well-documented in publicly-available guidelines; thus, PSM is the approach used in this Guideline. (See References)

5.1 TAILOR MEASURES

As a project team organizes its plan, it uses the tailoring process to identify its key issues (risks, problems, lack of information) and determine what measures to gather to help deal with those issues. Based on the project's objectives, constraints, risk analysis results, and other planning activities, the team identifies the project's key effectiveness and efficiency issues. As it considers measures to gather, the team attempts to define a set of measures that provides the greatest useful information at the lowest cost (see also *Process for Project Planning*.)

Purpose: To identify key issues and select a set of measures to handle those issues that yield the most useful information at the lowest cost.

Entry Criteria:

- Risk analysis has been completed (see *Process for Analyzing and Managing Project Risk*)
- Project objectives, constraints and scope of work are clearly defined
- Agency issues in project effectiveness and efficiency are defined

Roles	Tasks
Project Manager, Project Team	<ul style="list-style-type: none">• Identify and prioritize project issues<ul style="list-style-type: none">- Review project risks, as well as organization risks that impact the project- Review project objectives and requirements, to identify any problems, items yet to be determined, open questions, or conflicts- Prioritize the set of project issues, selecting the top 3 to 5 as the key issues to handle
Project Manager, Project Team, Measurement Analyst	<ul style="list-style-type: none">• Select project measures to handle the key issues<ul style="list-style-type: none">- Map project issues to the PSM common issue areas- For each issue, select a measurement category and an appropriate measure from the PSM Issue-Category-Measure table- Identify the information needed for handling the issue, and the indicators (graphs, charts, tables) that would be useful for reporting that information

Roles	Tasks
	<ul style="list-style-type: none"> If an issue does not map to a PSM common issue area, or if there is no appropriate category or measure, use the PSM process for defining a new measure
Measurement Analyst	<ul style="list-style-type: none"> Specify the measurement data requirements, identifying what information is to be gathered by whom at what point in the project Specify the indicators to be used for reporting results
Project Manager, Measurement Analyst	<ul style="list-style-type: none"> Identify activities to support measurement that need to be integrated into the project work breakdown structure Document the measurement plan as part of the Project Development Plan <ul style="list-style-type: none"> Measures gathering and analysis activities Definitions of measures and indicators Plans to report the measures results
Quality Assurance	<ul style="list-style-type: none"> Review the measurement plan and provide feedback

Exit Criteria: • A Measurement Plan had been developed, reviewed and approved

5.2 APPLY MEASURES

As the project runs, the team uses this activity to gather the measures, analyze them, and use the results for decision-making. Risk and financial status information are also considered, along with results of the identified measures when making decisions. During analysis, additional questions may be raised and new issues identified, so this activity is iterative in nature.

Purpose: To collect and analyze the measurement data specified in the measurement plan, to provide objective information for project- and agency-level decisions.

Entry Criteria: • Measurement Plan (section of the Project Development Plan) has been developed, reviewed and approved
• Project is executing, thereby creating measurement opportunities

Roles	Tasks
Project Team	<ul style="list-style-type: none"> Provide data, with support of automation and tools, as defined in plan (Note that some of this may be collected through software such as the Configuration Management System.)
Measurement Analyst	<ul style="list-style-type: none"> Collect or access the data at the intervals agreed to in the plan, preserving anonymity of sources as appropriate Verify accuracy and currency of the data Process the data, to generate the agreed on indicators and reports
Measurement	<ul style="list-style-type: none"> Analyze results and address the project issues, using methods

Roles	Tasks
Analyst, Project Manager, Quality Assurance	<p>appropriate to the project need, such as the ones documented in the PSM guidance</p> <ul style="list-style-type: none"> - Develop quality estimates - Analyze feasibility of Project Development Plan - Analyze performance against the Project Development Plan
Project Manager, Senior Management, Quality Assurance	<ul style="list-style-type: none"> • Make decisions based on analysis <ul style="list-style-type: none"> - Review the issue or decision at hand - Review the measurement results and trends indicated - Determine best approach or decision, using the data - Define the required actions - Identify the expected results and relative cost/benefit of each - Execute the actions and monitor the results

Exit Criteria: • The project is completed or terminated

6. MEASURES OF THE MEASUREMENT PROGRAM

Measures that can be used to track and manage measurement activities include the following.

Handling of Measurement Planning and Application - Track items such as the following:

- Effort required – compare the amount of measurement effort to what was expected
- Number of decisions traceable to measurement data; number of actions based on decisions that achieved desired outcome

Measures that are useful for handling project progress, product quality, and process effectiveness can be found in the Practical Software Measurement guidance. See the appendix on Additional Resources for how to locate that information.

7. VERIFICATION ACTIVITIES

During project effectiveness and efficiency measurement, the following verification activities are appropriate for management:

- Review the measurement assumptions and identified issues being used by the project manager and project team at the outset of measurement planning.
- Review drafts of project plan measurement sections as they are developed, to provide input and comments on selected measures, analysis approach and reporting strategy.
- Review the results of analysis, and particularly the decisions based on the analysis.

The following verification activities are appropriate for Quality Assurance:

- Review drafts of the project plan section dealing with measurement, to provide input and comments on assumptions, selected measures, analysis approach and reporting strategy.

- Review the results of analysis, paying particular attention to the analysis of estimates and plan feasibility. Check project performance analyses for consistency of data, and performance that may look a little too good.
- Review major project decisions and trace the decisions to the underlying information and measurement data.

8. DOCUMENT CONTROL

Revision	Date	Description
0.1	12/01/99	First draft; for internal review
0.2	12/7/99	Updated with diagram modifications, activity details, and tailoring guidance
0.3	12/7/99	Includes all internal feedback
1.0	2/1/00	Incorporate Advisory Group revisions

A. ADDITIONAL RESOURCES

Project Measurement Bibliography

Basili, V.R. & Weiss, D. A methodology for collecting valid software engineering data. *IEEE Transactions on Software Engineering*, volume 10, number 3, 1984, p. 728-738

Card, David and Khaled El Emam, co-editors. ISO 15939 Software Measurement Process, draft standard in progress, 1999.

“How to Measure Performance: A Handbook of Techniques and Tools”, prepared by the Training Resources and Data Exchange (TRADE) Performance-Based Management Special Interest Group for the Special Project Group, Assistant Secretary for Defense Programs and the Office of Operating Experience, Analysis and Feedback, Assistant Secretary for Environment, Safety and Health U.S. Department of Energy, October 1995

Practical Software Measurement Support Center. *Practical Software Measurement, A Foundation for Objective Project Management*, version 3.1a, July, 1998 and draft versions of 4.0 for mid-1999.

Statz, Joyce A. What’s Practical About Software Measurement? *Cutter IT Journal*, volume 12, number 4, April 1999.

Internet Resources

Current version of the Practical Software Measurement (PSM) guidance and tools are available at www.psmc.com.

B. SUPPORTING TEMPLATES

Please see the following items, accessible separately:

- **Issues, Categories and Measures Table** – generic classifications of software issues, with their associated measurement categories and measures
- **Issue Identification Worksheet** – a template for identifying and prioritizing issues (problems, risks and lack of information,) with the rationale for the priority
- **Measures Tailoring Worksheet** – a template for use with the two prior items in this section. Facilitates identification of appropriate measurements for project issues
- **Measurement Specification Worksheet for Data** – a template to use in specifying the measures that will be used in the project
- **Example Measurement Specification Worksheet for Data** – an example of a completed Measurement Specification Worksheet
- **Software Measurement Plan Outline** – an outline of topics for the Measurement Plan, generally incorporated as a section of the Project Development Plan

C. SUPPORTING CHECKLISTS

Please see the following checklists, accessible separately:

- **Analysis Checklist for Estimation** – a checklist for use in evaluating the accuracy of the Project Development Plan estimate
- **Analysis Checklist for Feasibility** – a checklist for use in evaluating the feasibility of the Project Development Plan
- **Analysis Checklist for Performance** – a checklist for use in evaluating project performance against the Project Development Plan